Description

snow-blower

Technical Field

[0001]

This invention relates to a snow-blower, and more particularly to a small-sized, lightweight snow-blower which is manually operated.

Background Art

[0002]

In snowy regions, road snow removal operations are popularized; i.e., snow accumulated on roads is removed to the asides of the roads by means of a large-sized snow removal vehicle. During such snow removal, the snow removed to a roadside is compressed and hardened, and in some cases, the removed snow forms mound-like snow-banks having a height of more than 50 cm. The thus-formed snow-banks may block paths in front of stores or houses of residents living in the snowy regions. Therefore, the residents are forced to manually remove such snow-banks with a snow scoop or a Snow Dump (which is a type of snow scoop operated by both hands) for securing the walkways for their businesses and daily life. In recent years, the number of young people has been decreasing in such regions, due to a trend toward nuclear families and aging of society, and thus, such manual snow removal, which is laborious, must be performed by aged

persons or women with little physical strength. In view of the foregoing, demand has arisen for a small-sized, lightweight snow-blower which can be easily handled by aged persons or women.

[0003]

Small-sized snow-blowers which are currently put into practice in Japan generally have a structures including a ribbon screw (called "auger") for cutting and collecting snow; an impeller (called "blower") for blowing snow; and a hollow cylinder (called "shooter") for throwing snow in a predetermined direction, the ribbon screw and the impeller being driven by an engine. Most of such snow-blowers are made up such that they are moved back and forth by means of a crawler (also called "caterpillar") driven by an engine. In such a small-sized snow-blower, as described in Patent Document 1 or 2, the auger can be moved up and down by means of a drive source (e.g., hydraulic pressure, pneumatic pressure, or gas spring), whereby snow-banks having a height up to 50 cm can be disposed of. However, as described in Non-Patent Document 1, the aforementioned snow-blower is 100 kg or more in spite of its relatively small size, and thus the snow-blower cannot be easily handled by aged persons or women. In addition, difficulty is encountered in commercially providing such a snow-blower at low price, in view of its structure, and improvement is awaited for simplified operation or noise reduction. Thus, such a snow-blower is not prevalent in general households.

[0004]

In Patent Document 3 proposes, there is described a more lightweight, inexpensive snow-blower having a structure similar to that described above, which includes an auger and a blower driven by an engine, and a sliding plate (slider) serving as a moving mechanism, and which can be moved manually. This snow-blower is about 20 kg, and is easy to operate. However, when this snow-blower is employed for cutting hard snow-banks, there is a problem that the snow-blower per se mounts on the snow-banks, and the cutting speed of the auger cannot be increased. Moreover, since this snow-blower does not have a mechanism for moving the auger up and down, when the snow-blower is employed for disposing of high snow-banks, the entirety of the snow-blower must be lifted up by the operator, and then mounted on the snow-banks. Thus, the height of snow-banks which can be disposed of with this snow-blower by a typical operator is limited to about 25 cm or less. Meanwhile, no particular measures have been taken for reducing engine noise in this proposed snow-blower, and therefore the snow-blower has not yet acquired popularity, despite having been commercialized as a practical product.

[0005]

The Toro Company (US) has developed and commercialized a lightweight, small-sized snow-blower with reduced noise, which is driven by an electric motor (see Non-Patent Document 2). This small-sized snow-blower is 15 kg or less, and includes lightweight wheels for back-and-forth movement, and

thus can be handled with ease by aged persons or women. However, since this snow-blower does not have a mechanism for moving an auger up and down, the height of snow-banks which can be disposed of with this snow-blower is limited to about 25 cm or less. In addition, a light weight blade employed in this snow-blower cannot cut hard snow-banks.

[0006]

In patent Document 4, there are proposes of a small-sized snow-blower including a frame, a pair of wheels provided on the rear side of the frame for back-and-forth movement, and snow-removing blades provided on the front side of the frame, the blades being driven for dispersing snow backward the snow-blower. However, this proposed snow-blower does not have a mechanism for moving an auger up and down, and thus issues a problem in that the height of snow-banks which can be disposed of with the snow-blower is limited to about 25 cm or less.

[0007]

Patent Document 1: Japanese Patent Application Laid-Open (*kokai*) No. 2000-290951

Patent Document 2: Japanese Patent Application Laid-Open (*kokai*) No. 2002-363940

Patent Document 3: Japanese Patent Application Laid-Open (*kokai*) No. 7-259041

Patent Document 4: Japanese Utility Model Registration No. 3043945

Non-Patent Document 1: Yamaha Motor Co., Ltd.,

Catalogue "Snowmate," 2003

Non-Patent Document 2: The Toro Company (US), Catalogue "Electric Snowthrower," 2003

Disclosure of the Invention

Problems to be solved by the Invention

[0008]

An object of this invention is to provide a small-sized, lightweight snow-blower which can dispose of hard snow-banks of higher than 50 cm, and which is easy to handle by aged persons or women.

Means for Solving the Problems

[0009]

This invention provides a snow-blower comprising a frame; an auger for cutting accumulated snow, the auger being provided on the front end side of the frame; an operation handle provided on the rear end side of the frame; and means for causing the snow-blower to move on snow (hereinafter the means may be referred to as "on-snow moving means"), the means being mounted on a middle portion of the frame and formed of an arc-shaped sliding member or a wheel, wherein the frame is structured such that it functions as a lever in which the portion on which the on-snow moving means is mounted serves as a fulcrum, and such that the auger can be moved up and down and back and forth by means of the operation handle; and the frame is provided with means for

driving the auger. Preferably, the snow-blower is structured such that the accumulated-snow-cutting auger can cut accumulated snow in an upwardly cutting direction.

[0010]

This invention also provides a snow-blower comprising a frame; a main auger for cutting accumulated snow, the main auger being provided on the front end side of the frame; a snow-collecting auger which is provided on the rear side of the main auger, and is rotated in a direction opposite to that of the main auger; an operation handle provided on the rear end side of the frame; and on-snow moving means which is mounted on a middle portion of the frame and includes an arc-shaped sliding member or a wheel, wherein the frame is structured such that it functions as a lever in which the portion on which the on-snow moving means is mounted serves as a fulcrum, and such that the auger can be moved up and down and back and forth by means of the operation handle; and the frame is provided with means for driving the main auger and the snow-collecting auger. Preferably, the snow—blower is structured so that the accumulated-snow-cutting main auger can cut accumulated snow in an upwardly cutting direction.

[0011]

In each of the snow-blowers of this invention, the operation handle provided on the frame may comprise an upper handle section and a lower handle section, and preferably, a snow-throwing device is fixed on an auger cover, and provided on a tilt-adjusting stand which can be tilted with respect to

the frame by a link mechanism.

Effects of the Invention

[0012]

The small-sized snow-blower of this invention can be produced to be lightweight and compact, and the auger of the snow-blower can be lifted up above snow-banks. Therefore, using the snow-blower, even aged persons or women can easily dispose of hard accumulated snow (in particular, snow-banks) having a height of 50 cm or more. Particularly when the snow-blower is structured such that the auger is rotated in an upwardly cutting direction, advantageously, the operator can manipulate the snow-blower easily as he feels cutting forces as a resistance to hands. Thus, the snow-blower of this invention exhibits excellent effects of solving aging-society-related or nuclear-family-related problems in terms of domestic snow removal in snowy regions.

Best Mode for Carrying Out the Invention

[0013]

FIG. 1 is a side view showing a snow-blower according to a first embodiment of this invention; FIG. 2 is a plan view of the snow-blower; and FIG. 3 is a front view of the snow-blower. FIG. 4 is a schematic explanatory view showing the operation mechanism of the snow-blower of FIG. 1. FIGs. 5 through 7 are side views respectively showing snow-blowers according to second through fourth embodiments of this

invention.

[0014]

As shown in FIGs. 1, 2, and 3, the snow-blower according to this invention includes a frame 10, which is a main part of the body of the snow-blower; a snow-bank cutting section 40 which is provided on the front end portion of the frame 10 and includes an auger 41; a snow-throwing mechanism 50 provided on the back surface of the snow-bank cutting section; driving means 30 for driving the snow-bank cutting section 40 and the snow-throwing mechanism 50; and on-snow moving means 20 mounted on a middle portion of the frame 10. An operation section 11 constitutes a portion (i.e., a rear end portion) of the frame 10.

[0015]

As schematically shown in FIG. 4, in the snow-blower of this invention, the frame 10 has such a shape that it can act as a lever as a whole and can be swiveled about a fulcrum 16. Arc-shaped sliders 21 are mounted on the frame 10 with the fulcrum 16 being the center of the arc. The snow-bank cutting section 40, which includes the auger 41, is mounted on the front end side of the frame 10, and the operation section 11, which includes upper handles 12 and lower handles 13, is mounted on the rear end side of the frame 10. Therefore, the operator can move the snow-blower back and forth by human power, and can easily lift up the auger 41 above a snow-bank S by moving the handles (the upper handles 12 or the lower handles 13) downward. In the case where a

snow-blower having only one pair of handles is employed, a limitation is imposed on the height of a snow-bank to be disposed of with the snow-blower, since, from the ergonomic viewpoints; a limitation is imposed on the level to which the handle can be moved downward. In contrast, in the case where the snow-blower shown in FIG. 4, which includes the upper handles 12 and the lower handles 13, is employed, when the lower handles are moved downward to a position equal to or lower than the level of the knee of the operator, if the upper handles 12 are operated by the operator instead of the handles 13, a high snow-bank can be handled with the snow-blower.

[0016]

Thus, high snow-banks can be disposed of with the snow-blower of this invention. As described below, when the auger for cutting accumulated snow is rotated in an upwardly cutting direction, the snow-blower is very easily controlled by the operator. This mechanism will next be described.

[0017]

Firstly, as shown in FIG. 4, when the lower handles are moved forward by the operator, the entirety of the snow-blower slides on snow by means of the sliders 21 and moves toward the snow-bank S. In such a condition, the auger 41 is rotated in an upwardly cutting direction through driving means (not illustrated in FIG. 4), whereby cutting of the snow-bank S is initiated. The thus-cut flakes of snow (hereinafter referred to simply as snow) are hurled upward or

backward by the auger 41 rotated in an upwardly cutting direction, and the snow is disposed of with the below-described snow-throwing mechanism. When the lower handles 13 are moved downward by the operator during cutting, the frame 10 is swiveled about the fulcrum 16. As a result, the auger 41 is lifted up along the side surface of the snow-bank S, and then an upper portion of the snow-bank S is cut and disposed of. Thus, operation of the handles by the operator moves the snow-blower forward, and lifts up the auger, whereby the entirety of the snow-bank is handled with the snow-blower.

[0018]

As described above, the snow-blower of this invention is structured such that the auger is lifted up along a snow-bank through the principle of leverage. Therefore, the snow-blower can handle a high snow-bank. In addition, when the auger of the snow-blower of this invention is rotated in an upwardly cutting direction, the force F3 exerted by the operator to move the lower handles 13 downward can be controlled very easily.

[0019]

Specifically, the force F3 applied to the lower handles 13 when the operator moves the handles downward is transmitted to the auger provided on the front end side of the frame 10 by means of leverage of the frame 10. Conversely, the downward force F1 on the basis of the weights (gravitational forces) of the driving means 30, the snow-bank

cutting section 40, the snow-throwing mechanism 50, etc., which are provided at the front end of the frame 10, as well as a reaction force F2 on the basis of rotation of the auger 41 in an upwardly cutting direction, are transmitted from the auger to the lower handles. Therefore, the operator feels the cutting force of the auger 41 as the reaction force F2, and thus can dispose of snow-banks having different harness with an appropriately maintained cutting force being exerted against the snow-banks. The downward reaction force F2 generated from the auger 41 exhibits the effect of preventing the snow-blower from being uplifted during snow removal. Therefore, the weight of the entirety of the snow-blower can be reduced.

[0020]

Specific embodiments of this invention will next be described.

[0021]

In a first embodiment shown in FIG. 1, the frame 10 is divided into an upper frame section 10A including the upper handles 12 and the lower handles 13, and a lower frame section 10B. The upper frame section 10A and the lower frame section 10B are jointed together by connection means (e.g., a bolt). As shown in FIGs. 2 and 3, the frame 10 includes a pair of symmetric frame members, and these members are jointed together by means of an upper handlebar 14, a lower handlebar 15, and a connection member 17, to thereby form the body of the snow-blower. The frame 10 can be produced

through, for example, press forming of steel plate, and thus the weight of the snow-blower can be reduced.

[0022]

The sliders 21, whose bottom portions are made up an arc shape, are mounted on a position slightly forward of the middle position of the frame 10 such that the sliders are united with the frame 10, so as to form the on-snow moving means 20. The center of the arc-shaped sliders 21 serves as the fulcrum 16 when the frame 10 functions as a lever.

[0023]

The front end of the frame 10 is connected to an auger cover 42. The auger cover 42 includes a side cover section 43 and a back cover section 44. The side cover section 43 includes a pair of symmetric cover members, and a bearing (not illustrated) and a worm gear speed reducer 36 are mounted at approximately the center of the side cover section 43. The auger 41 is pivotally supported on the bearing. The back cover section 43 substantially covers the upper and back surfaces of the auger 41, and has, on its back surface side, an opening leading to a blower casing 51 of the snow-throwing mechanism 50.

[0024]

On the back side of the auger cover 42, the blower casing 51 is mounted directly on the frame 10. The blower casing 51 includes a blower 52 therein, and has, on its upper portion, an opening leading to a shooter 53 and a shooter cap 54. On the back side of the blower casing 51, the driving

means 30, which includes an electric motor 31, a speed reduction gear 32, etc., is mounted directly on the frame section 10B.

[0025]

The electric motor 31, the speed reducer 32, the worm gear speed reducer 34 of the auger 41, and a drive shaft (not illustrated) of the blower 52 are coaxially connected to a drive shaft 33, so that the auger 41 can be rotated in an upwardly cutting or downwardly cutting direction. The electric motor 31 is connected to an appropriate power supply, and switches 35A and 35B for the motor are provided on the upper and lower handles 12, 13, respectively.

[0026]

In the snow-blower according to the first embodiment shown in FIG. 1, which has the aforementioned structure, when the electric motor is started through operation of the switch 35A or 35B, the auger 41 and the blower 52 begin to rotate. The snow-bank S is cut through rotation of the auger 41, and the thus-cut snow is trapped in the auger cover 42. Subsequently, the snow is aspirated into the blower casing 51 as the blower 52 rotates, and then are thrown out of the casing through the shooter 53 and the shooter cap 54 in a predetermined direction. In this case, the snow-blower can be operated as described above with reference to FIG. 4, whereby a high snow-bank can be handled easily.

[0027]

FIG. 5 is a side view showing a snow-blower according

to a second embodiment of this invention. The snow-blower according to this embodiment includes a main auger 46 for cutting accumulated snow; and a snow-collecting auger 47 which is provided on the rear side of the main auger 46, and is rotated in a direction opposite to that of the main auger 46. These augers are coaxially connected to the drive shaft 33 such that the augers are rotated by means of the shaft 33. However, the augers are made up such that the rotation directions thereof differ from each other by means of the worm gear speed reducers 34 and 36 mounted on the bearings for supporting the rotation shafts of the augers. The main auger 46 and the snow-collecting auger 47 respectively have spiral blades. These blades have the same pitch and are rotated at the same speed in opposite directions, and an appropriate phase angle is provided between the blades. The fundamental structure of the snow-blower according to the second embodiment is the same as that of the snow-blower according to the first embodiment, except for the above-described auger mechanism.

[0028]

In the snow-blower having the aforementioned structure, the moving direction of snow flakes formed through cutting of snow-banks by the main auger 46 is reversed by means of the snow-collecting auger 47. The snow is brought into the shooter 53 by the blower 52, and then thrown out in a predetermined direction. Employment of the snow-blower having this structure can prevent reduction of efficiency in

collecting snow which is present particularly in the vicinity of the ground level. Similar to the case of the auger of the snow-blower according to the first embodiment, the main auger 46 must have a function of cutting snow-banks, and therefore must provide a cutting force suited for the conditions of snow-banks to be handled. In contrast, the snow-collecting auger 47 does not necessarily have any function other than a function of collecting, to a center portion of the auger 47 in a width direction, flake-like snow produced through cutting of snow-banks by the main auger 46, and of sending the snow into the blower casing 51. Therefore, the auger 47 may be formed of a flexible material such as rubber. With this structure, impact on the auger, which is due to, for example, biting inclusions except for snows, can be reduced. Similar to the case described above, in this case, when the main auger is rotated in an upwardly cutting direction, the operator can feel the cutting force of the auger 41 as the reaction force F2, and thus can dispose of snow-banks having different hardness while maintaining appropriate cutting forces against the snow-banks.

[0029]

FIG. 6 is a side view showing a snow-blower according to a third embodiment of this invention. In this embodiment, the snow-throwing mechanism 50 is provided on a tilt-adjustable table 61, and the tilt-adjustable table 61 can be tilted with respect to the frame 10 by means of a tilting mechanism 60.

[0030]

The tilting mechanism 60 typically has a structure shown in FIG. 6, wherein a crank 63 is mounted on the frame 10 by means of a fixed pin 65, so as to rotate around the pin, and the tilt-adjusting table 61, which can be tilted by a revolution handle 68, is mounted on the upper portion of the crank 16. Specifically, an elongated hole 62 is formed in the rear portion of the tilt-adjusting table 63, and the crank is mounted on the tilt-adjusting stand such that a slide pin 64 provided on one end of the crank 63 slides in the elongated hole. In addition, a unit including a threaded rod 68, a fixing nut 69 (which is fixed on the frame 10), and the rotation handle 70 is mounted in a thrust bearing 66 provided on the other end of the crank 63, such that the effective length of the threaded rod 46 is variable. Therefore, when the rotation handle 70 is operated by the operator such that the effective length of the threaded rod 68 increases, the slide pin 65 moves backward in the elongated hole 62 in response to an increase in the effective length of the rod, and as a result, the tilt-adjusting stand 61 is tilted backward.

[0031]

As shown in FIG. 6, the driving means 30 and the snow-throwing mechanism 50 are mounted on the tilt-adjusting table 61. In the case where high snow-banks are to be handled with the snow-blower of the first embodiment, the shooter 53 of the snow-throwing mechanism is tilted toward the operator as

the frame 10 is tilted, and the snow thrown out of the shooter might hit the operator. However, in the case of the snow-blower of the fourth embodiment, which includes the tilt-adjusting mechanism 60, the direction in which snow is thrown can be freely changed by the operator, and thus the aforementioned problem can be avoided.

[0032]

FIG. 7 is a side view showing a snow-blower according to a fourth embodiment of this invention. In this embodiment, the slider 21 constituting the on-snow moving means 20 shown in FIG. 1 is replaced by a wheel 22. The fundamental structure of the snow-blower of this embodiment is the same as that of the snow-blower of FIG. 1, except for the on-snow moving means. According to this embodiment, even in the case where no snow is present on the road surface, and therefore snow-blower is difficult to move by means of a slider, the snow-blower can be moved toward snow-banks, and snow removal can be performed by means of the snow-blower.

Example 1

[0033]

A snow-blower according to the first embodiment was employed, where the fulcrum 16 of a frame 10 was positioned 213 mm above ground level, and arc-shaped sliders 21 having a radius of 213 mm (as measured from the fulcrum serving as the center of the sliders) were provided such that the frame 10 was swiveled about the fulcrum 16. An auger having a

diameter of 220 mm was provided at a position 410 mm in front of the fulcrum 16, and a lower handlebar 15 was provided at a position 1,000 mm backward of the fulcrum 16. The angle of the lower handlebar 15 as viewed from the fulcrum 16 was set at 60° from the horizontal level. With this structure, when the auger is positioned on the ground, the level of the lower handlebar 1 is 1,079 mm, which is almost equal to human shoulder level. Subsequently, when the lower handlebar 15 is moved downward, and the frame 10 is swiveled by 60°, the lower handlebar 15 is positioned about 213 mm above ground level. At this time, an upper handlebar 14 is positioned 500 mm above ground level; i.e., the level of the upper handlebar 14 is almost equal to the waist level of the operator. Therefore, when the operator operates the upper handlebar instead of the lower handlebar, the operator can further perform snow removal.

[0034]

Through the aforementioned handle operation, the angle of the axis formed by connecting the center of the auger 41 and the fulcrum 16 with respect to the horizontal line is changed from -15° (15° downward) to +45° (45° upward). Thus, the level of the upper end of the auger is increased from 220 mm to 615 mm, and as a result, snow-banks having a height of 600 mm can be handled.

[0035]

The force required for moving the aforementioned handlebar downward is determined on the basis of the moment

of gravity around the fulcrum 16 and the cutting force applied to the front end of the auger 41. When the lower handlebar 15 is operated, the downward force is 366 N (36.5 kgf) at maximum (typically 150 N (14.8 kgf)), which includes the force attributed to the self-weight of the snow-blower (i.e., 56 N (5.57 kgf)). When the upper handlebar 14 is operated, the downward force is 120 N (12.0 kgf) at maximum (typically 35 N (3.5 kgf)), which includes the force attributed to the self-weight of the snow-blower (i.e., -1.5 N (-0.15 kgf)). As a prerequisite for these figures, maximum cutting force is a value obtained when the maximum output of a motor is 2,600 J/s (2,600 W), and typical cutting force is determined to be 30% of the maximum cutting force on the basis of experiences. The force based on the self-weight of the snow-blower corresponds to the force required for moving the handlebar downward when cutting is not performed. When the lower handlebar 15 is operated, the handles stay at the original position by means of the self-weight of the snow-blower, whereas when the upper handlebar 14 is operated, the snow-blower falls backward. The cutting force is determined when the auger is rotated in an upwardly cutting direction. [0036]

Snow was removed using the snow-blower of the first embodiment having the aforementioned dimensions, in which the auger was rotated in an upwardly cutting direction. Table 1 shows comparison between the results of snow removal performed by the snow-blower and those of snow removal

performed by a commercially available small-sized snow-blower. The snow-blower employed for comparison was selected from among small-sized snow-blowers which are described in Non-Patent Document 1 and which can handle snow-banks having a height of 40 cm or more. The comparative snow-blower is the most lightweight one of the small-sized snow-blowers. The output of the snow-blower according to this invention is about 60% that of the comparative snow-blower, and the snow-removing performance of the inventive snow-blower is about 27% that of the comparative snow-blower. However, the inventive snow-blower is lighter than the comparative snow-blower; i.e., the mass of the inventive snow-blower is about 25% that of the comparative snow-blower, and the height of snow-banks which can be handled with the inventive snow-blower is 136% (i.e., considerably higher than) that of snow-banks which can be handled with the comparative snow-blower. Therefore, the snow-blower of this invention, despite requiring a long period of time for snow removal, can easily handle high snow-banks with less labor. That is, the snow-blower of this invention is easier to handle by aged persons or women.

[0037]

[Table 1]

	Inventive snow-blower	Commercial snow-blower
Equipment mass (kg)	25 (38)	102
Snow-removing performance (t/kg)	9.5 (17.5)	35
Snow removal width (mm)	450	615
Snow removal height (mm)	600	440

Maximum snow-throwing distance (m)	5 (3.5)	14
Snow-throwing mechanism	Auger and blower	Auger and blower
Shoot rotation angle (°)	360	230
Moving mechanism	Hand pushing	Crawler
Power source	Electric motor	Gasoline engine
Maximum output (J)	26,000	44,000

Values in parentheses correspond to the case of Example 2.

Example 2

[0038]

A snow-blower of the second embodiment was employed, where the diameter of a main auger was regulated to 140 mm; the diameter of a snow-collecting auger is regulated to 220 mm; the distance between the shaft of the main auger and that of the snow-collecting auger was regulated to 130 mm; the main auger and the snow-collecting auger were formed of spiral blades which are rotated in opposite directions; and a predetermined angle was provided between these augers such that the augers do not come into contact with each other. The snow-blower efficiently handled snow-banks having a height of about 10 cm. Values in parentheses of Table 1 correspond to the results obtained in the case of the snow-blower of Example 2. Conditions described in Table 1 other than the values shown in the parentheses are the same as those in the case of the snow-blower of Example 1. In the case of Example 2, the power source is the same as that employed in Example 1, but the weight of the snow-blower is increased and the snow-throwing distance is shortened, as compared with the case of Example 1. However, in the case of

the snow-blower of Example 2, snow-collecting efficiency is increased, and snow-removing performance is considerably improved. The main auger is rotated in an upwardly cutting direction.

Brief Description of the Drawings

[0039]

[FIG. 1]

A side view showing a snow-blower according to a first embodiment of this invention.

[FIG. 2]

A plan view of the snow-blower of FIG. 2.

[FIG. 3]

A front view of the snow-blower of FIG. 1.

[FIG. 4]

An explanatory view showing the operation mechanism of the snow-blower of this invention.

[FIG. 5]

A side view showing a snow-blower according to a second embodiment of this invention.

[FIG. 6]

A side view showing a snow-blower according to a third embodiment of this invention.

[FIG. 7]

A side view showing a snow-blower according to a fourth embodiment of this invention.

Description of Reference Numerals

[0040]

10. Frame

10A. Upper frame section

10B. Lower frame section

11. Operation section

12. Upper handle

13. Lower handle

14. Upper handlebar

15. Lower handlebar

16. Fulcrum

17. Connection member

20. On-snow moving means

21. Slider

22. Wheel

30. Driving means

31. Electric motor

32. Speed reducer

33. Drive shaft

34. Worm gear speed reducer

35A, 35B. Switch

36. Worm gear speed reducer

40. Snow-bank cutting section

41. Auger

42. Auger cover

43. Side cover section

44. Back cover section

46. Main auger

47. Snow-collecting auger

50. Snow-throwing mechanism

51. Blower casing

52. Blower

53. Shooter

54. Shooter cap

60. Tilt-adjusting mechanism

61. Tilt-adjusting table

62. Elongated hole

63. Crank

64. Pin at Sliding position

65. Pin at fixed position

66. Pin at rotating position

67. Thrust bearing

68. Threaded rod

69. Fixing nut

68. Rotation handle

70. Rotation handle

S. Snow-bank